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## REMARKS

The Office Action of May 18, 2005 has been received and carefully reviewed. It is submitted that, by this communication, all basis of rejection are traversed and overcome. Upon entry of this communication, Claims 1-3, 5, 6, 8-21, and 23-42 remain in the application. Claims 4, 7, 22, and 43-46 have been cancelled. Reconsideration of the claims is respectfully requested.

Claim 3 has been amended to recite Ni(II)Y and Ni(II)X zeolites. Support for the revision may be found in the specification as filed in Experiment G.

Claims 1-9, 19, 20, 22, 24-28, 38, 39, and 42 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-4 and 7-15 of copending Application No. 10/234,681. Claims 1-9, 19, 20, 22, 25-28, 36-38, and 42 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the claims 1-20 of copending Application No. 10/613,131. Claims 1-9, 19, 20, 22, 25-28, 36-39, and 42 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-23 of copending Application No. 10/393,962. The Examiner states that although the conflicting claims are not identical, they are not patentably distinct from each other because the conflicting claims disclose a process substantially the same.

Three terminal disclaimers in compliance with 37 C.F.R. 1.321(c) are being filed concurrently with responses to Official Actions for 10/234,681, 10/613,131, and 10/393,962. It is submitted that these terminal disclaimers respectively overcome the provisional rejection of claims 1-9, 19, 20, 22, 24-28, 38, 39, and 42 based on the obviousness-type double patenting; 2) claims 1-9, 19, 20, 22, 25-28, 36-38, and 42 based on the obviousness-type double patenting; and 3) claims 1-9, 19, 20, 22, 25-28, 36-39, and 42 based on the obviousness-type double patenting.

Claims 1, 2, 4, 19, 21, 22, 25, and 26 stand rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as being obvious over Michlmayr (U.S. Patent No. 4,188,285). The Examiner states that Michlmayr discloses a process of removal of thiophenes from gasoline by contacting the feed with an adsorbent which is silver exchanged faujasite zeolite, namely silver-Y zeolite. Further, the Examiner admits that Michlmayr is silent as to the mechanism of how thiophene is bound to the adsorbent. The

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Examiner asserts, however, that it is expected that the silver-Y zeolite adsorbent of Michlmayr is inherently bound to thiophene by  $\pi$ -complexation. The Examiner goes on to state that it is expected that the Michlmayr adsorbent can inherently adsorb more than 1 mmol/gram of thiophene since the adsorbent of the claimed process and the one of Michlmayr are similar.

Applicants respectfully disagree with the Examiner's assertion that the Michlmayr adsorbent is inherently bound to thiophene by  $\pi$ -complexation. To facilitate  $\pi$ -complexation, a dehydrated adsorbent, as recited in Applicants' amended claim 1, is used. Support for the revisions to claim 1 may be found in the specification as filed at page 15, line 36 to page 17, line 1 and at page 11, lines 8-24. If water molecules remain in the adsorbent,  $\pi$ -complexation will generally not occur, rather the metal/metal ion will bond with the sulfur atom. Michlmayr does not teach or suggest that the adsorbent is dehydrated, as such, it is **not** inherent that the binding of thiophene to the Michlmayr adsorbent would occur via  $\pi$ -complexation.

Further, Applicants respectfully disagree with the Examiner's assertion that the Michlmayr adsorbent inherently adsorbs more than 1 mmol/gram of thiophene. Michlmayr teaches that the sulfur capacities range from 0.07 wt.% to 0.15 wt.% for Ag-Y, with a maximum of 0.2 wt.% (0.0238 mmol/g) (see Examples 1 and 2). It is submitted that the lower sulfur capacities described in Michlmayr result, at least in part, from water molecules remaining in the zeolite. As previously stated, Michlmayr does not teach or suggest that the adsorbent is dehydrated. As such, it is **not** inherent that a non-dehydrated adsorbent would adsorb as much thiophene/thiophene compounds (over 40 times more than that taught in Michlmayr) as the dehydrated adsorbent recited in Applicants' claim 1.

Further, claims 26 and 28 have been amended to recite that, "at ambient temperature and  $10^{-5}$  atm vapor pressure, the dehydrated adsorbent adsorbs more than about 1 mmol/gram of the at least one of thiophene and thiophene compounds." Support for these revisions may be found in the specification as filed at page 3, lines 25-26, page 14, lines 32-33, and in Examples A through C. Further, Applicants respectfully submit that one skilled in the art would know that vapor pressure would be used (see Beckman's website at: <http://www.beckman.com/products/instrument/partChar/technology/GasAdsorption.asp>, which states in part: "An adsorption isotherm (one temperature) is usually recorded as

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volume of gas adsorbed (cc/g @ STP) versus relative pressure (i.e., sample pressure / saturation vapor pressure).”).

As such, it is submitted that the Michlmayr reference does not teach or suggest a dehydrated adsorbent as recited in Applicants’ invention as defined in claim 1.

For all the reasons stated above, it is submitted that Applicants’ invention as defined in claim 1 and those claims ultimately depending therefrom is not anticipated, taught or rendered obvious in view of Michlmayr, either alone or in combination, and patentably defines over the prior art.

Claims 3 and 20 stand rejected under 35 U.S.C. 103(a) as being obvious over Michlmayr. The Examiner asserts that Michlmayr does not disclose that the silver exchanged Y zeolite is Ag(I)Y. The Examiner states, however, that it would be obvious to one skilled in the art to have modified the Michlmayr process by using Ag(I)Y, since it is expected that using any silver exchanged Y zeolite would yield similar results. The Examiner also admits that Michlmayr does not disclose that the gasoline is unleaded. However, the Examiner asserts that it would have been obvious to have modified the Michlmayr process by using unleaded gasoline.

Reiterating the arguments above with regard to Michlmayr, Applicants respectfully point out that Michlmayr does not teach an adsorbent that is capable of  $\pi$ -complexation. As such, it would not be obvious to modify the Michlmayr zeolite and to expect similar results, as the sorbents used are not the same. Further, as the adsorbent of Michlmayr is not the same as that used in Applicants’ process, one would not be led to modify the gasoline of Michlmayr’s process. Even if such a modification were obvious, one would not render Applicants’ invention, as the Michlmayr process does not involve  $\pi$ -complexation.

For all the reasons stated above, it is submitted that Applicants’ invention as defined in claims 3 and 20 is not anticipated, taught or rendered obvious by Michlmayr, either alone or in combination, and patentably defines over the prior art.

Claims 5 and 7 stand rejected under 35 U.S.C. 103(a) as being obvious over Michlmayr in view of Tsybulevskiy et al. (2002/0009404). The Examiner admits that Michlmayr does not disclose a carrier for the adsorbent. However, the Examiner states that Tsybulevskiy discloses an adsorbent also containing a binder, such as silica. The Examiner concludes that it would have been obvious to one skilled in the art to modify the process of Michlmayr by including a binder in the adsorbent to arrive at Applicants’ invention, since it

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is expected that this would increase the strength of the adsorbent. The Examiner further concludes that once the silica was selected, metals are expected to cover the binder.

Applicants respectfully submit that the combination of Michlmayr and Tsybulevskiy does not render Applicants' invention as defined in claims 5 and 7. Reiterating the above arguments, Michlmayr does not teach adsorbing thiophene or thiophene compounds via  $\pi$ -complexation.

The process taught in Tsybulevskiy actually teaches away from  $\pi$ -complexation by specifically stating that the selectivity was through physical adsorption--see Page. 3, paragraph [0036]:

These higher molecular weight sulfur compounds are then adsorbed by these synthetic faujasites. The **physical adsorption** of these sulfur compounds on zeolites is increased, due to their higher molecular weight. Because the adsorption of the sulfur compounds on the synthetic faujasites of the present invention is a two-stage process, i.e., first catalytic conversion of sulfur contaminated compounds, followed by **physical adsorption** of the catalytically converted products, these synthetic faujasites which are the subject of the present invention are termed "adsorbent-catalyst." (*emphasis added*).

Applicants respectfully submit that Tsybulevskiy does not teach or even inherently show the possibility of adsorbing through  $\pi$ -complexation. As such, the Examiner's suggested combination does not render Applicants' invention as defined in claim 1 (from which claims 5 and 7 ultimately depend), which recites preferential adsorption via  $\pi$ -complexation.

For all the reasons stated above, it is submitted that Applicants' invention as defined in claims 5 and 7 is not anticipated, taught or rendered obvious by Michlmayr and Tsybulevskiy, either alone or in combination, and patentably defines over the prior art.

Claim 6 stands rejected under 35 U.S.C. 103(a) as being obvious over Michlmayr in view of Tsybulevskiy et al., and further in view of Satokawa et al. (2001/00014304). The Examiner admits that Michlmayr does not disclose that the silver is silver nitrate. However, the Examiner states that Satokawa discloses an adsorbent containing silver nitrate that is used for thiophene adsorption. The Examiner concludes that it would have been obvious to combine the teachings to render Applicants' invention as defined in claim 6.

As previously stated, the combination of Michlmayr, Milton, and Tsybulevskiy does not render an adsorbent capable of  $\pi$ -complexation, as recited in Applicants' claim 1.

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Satokawa teaches an adsorbent for the removal of sulfur (e.g. mercaptans) from natural gas. In the examples of Satokawa, the mercaptans were dimethyl sulfide and t-butyl mercaptan. The gas is a "city gas" including methane, with small amounts of ethane, propane and pentanes (see paragraph [0039] of Satokawa). In sharp contrast, Applicants recite removal of thiophene/thiophene compounds from liquid fuel. Further, the sulfur-containing molecules of Satokawa are **saturated, not aromatic**, sulfides. In sharp contrast, thiophene/thiophene compounds in liquid fuel are **aromatic**, as non-aromatic sulfur molecules generally are not selectively adsorbed by the  $\pi$ -complexation dehydrated sorbents as recited in Applicants' claim 1.

Assuming *arguendo* that one skilled in the art would combine the suggested references, the combination would not render Applicants' invention as defined in claim 6, as none of the cited references teach the preferential adsorption of thiophene/thiophene compounds by  $\pi$ -complexation.

For all the reasons stated above, it is submitted that Applicants' invention as defined in claim 6 is not anticipated, taught or rendered obvious by Michlmayr, Tsybulevskiy, and Satokawa, either alone or in combination, and patentably defines over the art of record.

Claims 8-10, 14-17, 23, and 24 stand rejected under 35 U.S.C. 103(a) as being obvious over Michlmayr in view of Milton (U.S. Patent 2,882,244). The Examiner states that Michlmayr discloses a process of removal of thiophenes from gasoline by contacting the feed with an adsorbent which is silver exchanged faujasite zeolite, namely silver-Y zeolite. The Examiner admits that Michlmayr does not disclose how to activate and regenerate the spent adsorbent. The Examiner admits that Milton discloses activating and regenerating a molecular sieve adsorbent used for removing thiophene by raising the temperature. The Examiner also notes that Milton discloses that nickel can be used as a cation of the adsorbent. As such, the Examiner asserts that it would have been obvious to modify the adsorbent according to Milton's method to optimize the life of the adsorbent.

Assuming *arguendo* that it would be obvious to combine the teaching of Michlmayr and Milton, one would not render Applicants' invention as defined in claims 8-10, 14-17, 23, and 24. Neither Michlmayr nor Milton teaches a dehydrated adsorbent that preferentially adsorbs thiophene and/or thiophene compounds via  $\pi$ -complexation. As such, it would not be obvious that the activation and regeneration processes for an adsorbent that does not  $\pi$ -complex (described in Milton) would be useful for an adsorbent (such as that recited in

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Applicants' claim 1, from which claims 8-10, 14-17, 23, and 24 ultimately depend) that is capable of  $\pi$ -complexation.

For all the reasons stated above, it is submitted that Applicants' invention as defined in claims 8-10, 14-17, 23, and 24 is not anticipated, taught or rendered obvious by Michlmayr and Milton, either alone or in combination and patentably defines over the art of record.

Claims 11-13, and 18 stand rejected under 35 U.S.C. 103(a) as being obvious over Michlmayr in view of Milton, and further in view of Satokawa et al. The Examiner states that Michlmayr does not disclose that copper is used as the cation. However, the Examiner states that Satokawa discloses an adsorbent containing copper that is used for adsorbing thiophene. The Examiner concludes that it would have been obvious to one skilled in the art to have modified the Michlmayr process by using copper as the cation since Satokawa discloses that his adsorbent exhibits excellent absorptivity of sulfur compounds.

As previously stated, none of the cited references disclose an adsorbent that is capable of  $\pi$ -complexation. As such, the suggested combination would not render Applicants' invention as defined in claim 1, from which claims 11-13, and 18 ultimately depend. The use of a copper cation in an adsorbent that is not capable of  $\pi$ -complexation would not lead one skilled in the art to use copper in an adsorbent that is capable of  $\pi$ -complexation.

For the reasons stated above, it is submitted that Applicants' invention as defined in claims 11-13, and 18 is not anticipated, taught or rendered obvious by Michlmayr, Milton, and Satokawa, either alone or in combination, and patentably defines over the art of record.

Claims 27-29, 31-34, and 38-42 stand rejected under 35 U.S.C. 103(a) as being obvious over Michlmayr in view of Milton, and further in view of Tsybulevskiy et al. The Examiner states that Michlmayr discloses a process of removal of thiophenes from gasoline by contacting the feed with an adsorbent which is silver exchanged faujasite zeolite, namely silver-Y zeolite. The Examiner admits that Michlmayr does not disclose how to activate and regenerate the spent adsorbent. However, the Examiner asserts that Milton discloses how to activate a molecular sieve adsorbent used for removing thiophene by raising the temperature. The Examiner concludes that it would have been obvious to have modified the Michlmayr process by using Milton's method to activate the adsorbent. Further, the Examiner notes that Milton discloses that nickel can be used as a cation of the adsorbent.

The Examiner admits that Michlmayr is silent as to the mechanism of how thiophene is bound to the adsorbent. However, the Examiner states that it is expected that the silver-Y

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zeolite adsorbent of Michlmayr is inherently bound to the thiophene by  $\pi$ -complexation since the adsorbent of the claimed process and the one of Michlmayr are similar. The Examiner further notes that it would be expected that the Michlmayr adsorbent could inherently adsorb more than 1 mmol/gram of thiophene. Again, the Examiner admits that Michlmayr does not disclose unleaded gasoline nor that the silver exchanged Y zeolite is Ag(I)Y. However, the Examiner asserts that both of these would have been obvious. The Examiner further admits that Michlmayr does not disclose a carrier for the adsorbents. However, the Examiner asserts that it would have been obvious to use the binder, such as silica, as taught in Tsybulevskiy in the process of Michlmayr.

As previously stated, the combination of Michlmayr, Tsybulevskiy, and Milton does not render Applicants' invention as defined in any of claims 27-29, 31-34, and 38-42. Again reiterating the above arguments, none of the cited references teach adsorbing thiophene or thiophene compounds via  $\pi$ -complexation. Tsybulevskiy actually teaches away from  $\pi$ -complexation, and neither Michlmayr nor Milton discloses a dehydrated adsorbent capable of  $\pi$ -complexation.

For all the reasons stated above, it is submitted that Applicants' invention as defined in claims 27-29, 31-34, and 38-42 are not anticipated, taught or rendered obvious by Michlmayr, Milton, and Tsybulevskiy, either alone or in combination, and patentably defines over the prior art.

Claims 30 and 35 stand rejected under 35 U.S.C. 103(a) as being obvious over Michlmayr in view of Milton, further in view of Tsybulevskiy et al., and still further in view of Satokawa et al. The Examiner states that Michlmayr does not disclose that copper is used as the cation. However, the Examiner asserts that Satokawa discloses an adsorbent containing copper is used for adsorbing thiophene. The Examiner concludes that it would have been obvious to modify the Michlmayr process by using copper as the cation, since Satokawa discloses that his adsorbent exhibits excellent adsorptivity of sulfur compounds.

As previously stated, Satokawa teaches an adsorbent for the removal of mercaptans, which are not aromatic and have no  $\pi$  electrons. As such, Satokawa does not teach an adsorbent that is capable of  $\pi$ -complexation.

Assuming *arguendo* that one skilled in the art would combine the suggested references, the combination would not render Applicants' invention as defined in claims 30

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or 35, as none of the cited references teach the preferential adsorption of thiophene/thiophene compounds by  $\pi$ -complexation.

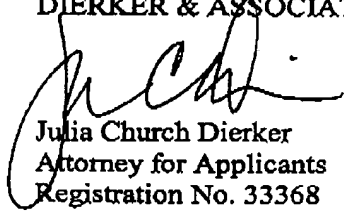
For all the reasons stated above, it is submitted that the Applicants' invention as defined in claims 30 and 35 is not anticipated, taught or rendered obvious by Michlmayr, Milton, Tsybulevskiy, and Satokawa, either alone or in combination, and patentably defines over the art of record.

In summary, claims 1-3, 5, 6, 8-21 and 23-42 remain in the application. It is submitted that, through this communication, Applicants' invention as set forth in these claims is now in condition for suitable for allowance. Further and favorable consideration is requested.

If the Examiner believes it would expedite prosecution of the above-identified application, he is cordially invited to contact Applicants' Attorney at the below-listed telephone number.

Respectfully submitted,

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